

WHAT IS CLAIMED IS:

1. An apparatus for fitting a hearing aid, comprising:  
5 a memory having a first population stored therein, the first population comprising a plurality of parent sets;  
a toggle device for toggling between a first pair of the plurality of parent sets;  
a select indicator for selecting a preferred one set of the first pair; and  
a communications link for interfacing with the hearing aid.  
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2. The apparatus according to claim 1, wherein each parent set of the plurality of parent sets comprises more than one parameter.
3. The apparatus according to claim 1, wherein the communications link is a wireless link.  
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4. The apparatus according to claim 1, further comprising a processor for ranking a hierarchy of the plurality of parent sets.
- 20 5. The apparatus according to claim 1, further comprising a processor for assigning a probability of selection by the select indicator to the plurality of parent sets.
6. The apparatus according to claim 1, wherein the plurality of parent sets comprises at least a first, second and third set, further comprising a genetic algorithm for  
25 deciding which of the first, second and third sets becomes the first pair.

7. The apparatus according to claim 1, further comprising a genetic algorithm operator for performing one of mutation and crossover on at least one set of the plurality of parent sets thereby forming a child set.

5 8. The apparatus according to claim 7, further comprising a genetic algorithm for replacing one of the plurality of parent sets in the first population with the child set thereby forming a second population.

10 9. The apparatus of claim 8, wherein the toggle device toggles between a second pair of sets selected from the second population.

10. The apparatus of claim 1, wherein the toggle device toggles between a plurality of pairs of the plurality of parent sets, further comprising a processor for converging the plurality of pairs to a single solution set.

15 11. A hearing aid fitted by the apparatus according to claim 1.

12. An apparatus for fitting a hearing aid, comprising:  
a memory having a first population stored therein, the first population comprising  
20 a plurality of parent sets;

a toggle device for toggling between a plurality of pairs of the plurality of parent sets, each of the plurality of pairs having a first and second set;

a select indicator for selecting a preferred one of the first and second set in the each of the plurality of pairs;

25 a genetic algorithm operator for performing one of mutation and crossover on at least one set of the plurality of parent sets thereby producing a child set;

a genetic algorithm for replacing one of the plurality of parent sets in the first

population with the child set thereby forming a second population wherein the toggle device toggles between another pair of sets, the another pair being selected from the second population;

5 a processor for converging the sets of the plurality of pairs and the another pair to a single solution set; and

a communications link for interfacing with the hearing aid.

13. The apparatus according to claim 12, wherein the processor ranks a hierarchy of the plurality of parent sets.

14. The apparatus according to claim 13, wherein the processor assigns a probability of selection by the select indicator to the sets of the plurality of pairs and the another pair.

15. The apparatus according to claim 14, wherein the genetic algorithm decides which of the plurality of parent sets becomes the first and second sets for each the plurality of pairs.

16. A hearing aid fitted by the apparatus according to claim 12.

17. A hearing aid, comprising:

a memory having a first population stored therein, the first population comprising a plurality of parent sets, each of the parent sets having at least one parameter;

a toggle device for toggling between a first pair of the plurality of parent sets; and

a select indicator for selecting a preferred one set of the first pair.

18. The hearing aid according to claim 17, further comprising an initial prescription setting and a reset mechanism for updating the initial prescription setting with one of the at least one parameters.
- 5 19. The hearing aid according to claim 17, wherein the toggle device is one of a software algorithm and mechanical mechanism.
20. The hearing aid according to claim 17, further comprising a processor for ranking a hierarchy of the plurality of parent sets.
- 10 21. The hearing aid according to claim 17, further comprising a processor for assigning a probability of selection by the select indicator to the plurality of parent sets.
- 15 22. The hearing aid according to claim 17, wherein the plurality of parent sets comprises at least a first, second and third set, further comprising a genetic algorithm for deciding which of the first, second and third sets becomes the first pair.
- 20 23. The hearing aid according to claim 17, further comprising a genetic algorithm operator for performing one of mutation and crossover on at least one set of the plurality of parent sets thereby forming a child set.
- 25 24. The hearing aid according to claim 23, further comprising a genetic algorithm for replacing one of the plurality of parent sets in the first population with the child set thereby forming a second population.

25. The hearing aid according to claim 24, wherein the toggle device toggles between a second pair of sets selected from the second population.
26. The hearing aid according to claim 17, wherein the toggle device toggles between a plurality of pairs of the plurality of parent sets, further comprising a processor for converging the plurality of pairs to a single solution set.
27. A method of fitting a hearing aid, comprising the steps:  
preparing a first population of a plurality of parent sets;  
presenting a first pair from the parent sets, the first pair comprising a first and second set and being presented with assistance of the hearing aid;  
selecting a first preference between the first and second sets of the first pair;  
operating on at least one set of the plurality of parent sets to obtain a child set, the child set being one of a mutation and crossover;  
replacing one of the plurality of parent sets of the first population with the child set to form a second population;  
presenting a second pair, the second pair comprising the child set and a third set, the third set being selected from the second population but not being the child set;  
selecting a second preference between the child set and the third set of the second pair; and  
converging on a solution set, the solution set being one of the first, second, third and child sets.
28. The method according to claim 27, further comprising the step of ranking a hierarchy of the plurality of parent sets.

29. The method according to claim 27, further comprising the step of assigning a probability of selection in one of the selecting steps to the first, second, third and child sets.

5 30. The method according to claim 27, further comprising the step of deciding which set of the plurality of parent sets becomes the first and second sets of the first pair.

31. A method of fitting a hearing aid, comprising the steps:

providing a hearing aid having an initial prescription;

10 preparing a population of a plurality of parent sets, each of the parent sets having at least one parent parameter;

presenting a first pair of sets from the parent sets, the first pair comprising a first and second set and being presented with assistance of the hearing aid;

selecting a first preference between the first and second sets of the first pair;

15 presenting a second pair of sets from the parent sets, the second pair comprising a third and fourth set;

selecting a second preference between the third and fourth sets of the second pair;

operating on one set of the plurality of parent sets to obtain a child set, the child set being one of a mutation and crossover of the one set, the child set having at least one child parameter;

20 replacing one of the plurality of parent sets of the first population with the child set to form a second population;

presenting a third pair of sets, the third pair comprising the child set and a fifth set, the fifth set being selected from the second population but not being the child set;

25 selecting a third preference between the child set and the fifth set;

converging on a solution set, the solution set being one of the first, second, third, fourth, fifth and child sets; and

updating the initial prescription with one of the at least one parent and child parameters.

32. A method of using a genetic algorithm in a system having a first population of a plurality of parent sets, comprising the steps;

presenting a first pair of sets from the parent sets, the first pair comprising a first and second set, the genetic algorithm selecting which of the parent sets becomes the first and second set;

indicating a preference to the genetic algorithm between the first and second sets of the first pair;

operating on at least one set of the plurality of parent sets with a genetic algorithm operator to obtain a child set, the child set being one of a mutation and crossover;

replacing one of the plurality of parent sets of the first population with the child set to form a second population;

presenting a second pair, the second pair comprising the child set and a third set, the third set being selected from the second population but not being the child set, the genetic algorithm selecting which set of the second population becomes the third set;

indicating a second preference to the genetic algorithm between the child set and the third set of the second pair; and

converging on a solution set, the solution set being one of the first, second, third and child sets.

33. A computer readable medium having executable instructions for performing the steps of claim 32.

34. A method of perceptually tuning a system using a genetic algorithm, comprising the steps:

providing a system an initial setting;

5 preparing a population of a plurality of parent sets, each of the parent sets having at least one parent parameter;

presenting a first pair of sets from the parent sets, the first pair comprising a first and second set, the genetic algorithm selecting which of the plurality of parent sets becomes the first and second set;

10 indicating a first preference to the genetic algorithm between the first and second sets of the first pair;

presenting a second pair of sets from the parent sets, the second pair comprising a third and fourth set, the genetic algorithm selecting which of the plurality of parent sets becomes the third and fourth sets;

15 indicating a second preference to the genetic algorithm between the third and fourth sets of the second pair;

operating on one set of the plurality of parent sets with a genetic algorithm operator to obtain a child set, the child set being one of a mutation and crossover of the one set, the child set having at least one child parameter;

20 replacing one of the plurality of parent sets of the first population with the child set to form a second population;

presenting a third pair of sets, the third pair comprising the child set and a fifth set, the fifth set being selected from the second population but not being the child set, the genetic algorithm selecting which set of the second population becomes the fifth set;

25 indicating a third preference to the genetic algorithm between the child set and the fifth set;

converging on a solution set, the solution set being one of the first, second, third, fourth, fifth and child sets; and



updating the initial setting with one of the at least one parent and child parameters selected from the solution set.

35. A computer readable medium having executable instructions for performing the steps of claim 34.

36. A method of using a genetic algorithm crossover operator on at least a first and second parent set in a system population, each of the parent sets having a plurality of parent parameters, each the parent parameter being represented by a parent index wherein the parent indexes can be arranged in a range from a low the parent index to a high the parent index, comprising the steps:

choosing a parent index position in the first and second parent sets with some of the parent indexes in each set of the first and second parent sets being to a left and right of the parent index position;

creating a child set, the child set having a child index position, further comprising the steps,

i) reproducing in the child set to a left of the child index position, the parent indexes of one of the first and second parent sets to the left of the parent index position;

ii) reproducing in the child set to a right of the child index position, the parent indexes of the other of the first and second parent sets to the right of the parent index position; and

iii) creating a child index at the child index position that is any value substantially equal to one of the low parent index, the high parent index and any the parent index in the range.

37. The method according to claim 36, wherein the range is linear.

38. A computer readable medium having executable instructions for performing the steps of claim 36.

39. A method of using a genetic algorithm mutation operator on at least one parent set in a system population, the one parent set having a plurality of parent parameters, each the parent parameter being represented by a parent index wherein the parent indexes can be arranged in a range from a low the parent index to a high the parent index, comprising the steps:

creating a mutation set having a plurality of mutation indexes;

summing the mutation indexes and the parent indexes to form a summation set having a plurality of summation indexes; and  
reproducing the mutation indexes in a child set.

40. The method according to claim 39, wherein the one of the mutation indexes is one of larger than the high parent index and smaller than the low parent index, wherein the step of reproducing the mutation indexes in the child set further comprises the step of rounding the one of the mutation indexes to one of the high parent index and the low parent index.

41. The method according to claim 39, wherein the step of creating the mutation set further comprises generating the mutation indexes by generating a plurality of random variables and rounding each the random variable to a closest integer.

42. The method according to claim 41, wherein the step of generating the plurality of random variables further comprises the step of creating a normal distribution for the random variables.

43. A computer readable medium having executable instructions for performing the steps of claim 39.